

DOOR OPENING AND CLOSING DEVICE OF AUTOMOBILE

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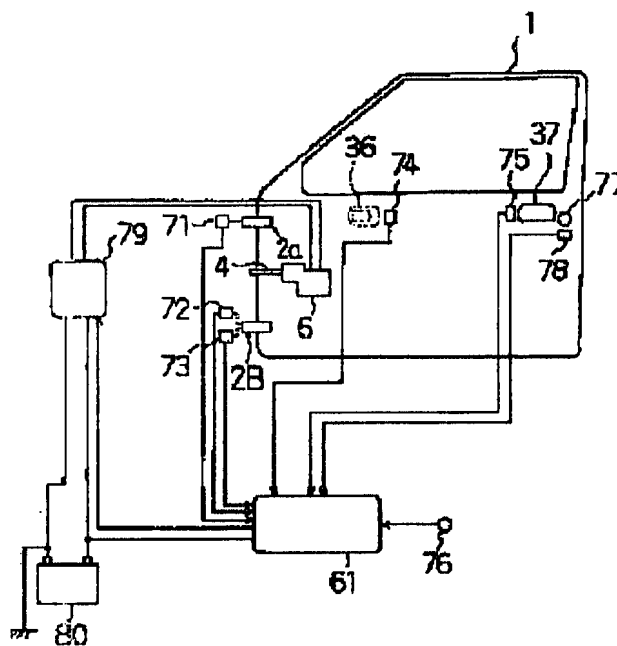
Application number: JP19930121086 19930524

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Abstract of JP6328940

PURPOSE:To open and close a door in the state suitable for several conditions by giving assist force at the time of opening and closing the door. **CONSTITUTION:**Opening and closing operational physical force of a door 1 is detected through a rotating sensor 71. In accordance with the opening and closing operational physical force of the door 1, an assist force giving member is driven by a motor 6 and assist force to assist opening and closing of the door 1 is given. When the opening and closing operational physical force is large, the assist force is increased, and when the opening and closing operational physical force is small, the assist force is decreased.



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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the door operator of the automobile which assists a door [closing motion].

[0002]

[Description of the Prior Art] Conventionally, so that it may be indicated by JP,62-75180,U The door-lock equipment which engages and releases the striker which installed the door handle in the end section by the side of disconnection of a door, was interlocked with this door handle, and was laid in the car-body opening edge is arranged in the front end section and the back end section of a door. While attaching in the center of abbreviation of said door through a swing arm at a car body In the breaker style of the swing door which collaborated with said swing arm and attached the upper limit or lower limit by the side of disconnection of said door in the car body through the Section 4 link member of a parallelogram While the movement toward lock discharge of said door-lock equipment is interlocked with between the other end of the door of the opposite side, and a car body and extruding a door to the method of outside to the disconnection side of said door, what arranged the door extruder style which returns after extrusion is known.

[0003]

[Problem(s) to be Solved by the Invention] However, in the thing of such structure, since a door was opened and closed automatically, it was needed to make it act on a door, and the fixed closing motion force was not always able to be changed according to conditions.

[0004] This invention aims at offering the door operator of the automobile which can open and close a door where terms and conditions are suited by giving the assistant force in the case of closing motion of a door.

[0005]

[Means for Solving the Problem] This invention attaches an actuator in the interior of Doat, or the Doat exterior, detects the actuation condition of a control unit prepared in this door, and is premised on the door operator of the automobile which assists a door [closing motion] with an actuator.

[0006] Invention of claim 1 is taken as a configuration equipped with an operating-physical-force detection means to detect the switching operation force of a door, and the control means which undergoes the output of this operating-physical-force detection means, and controls the assistant force by the above-mentioned actuator according to the switching operation force of a door.

[0007] Invention of claim 2 is taken as a configuration equipped with a speed detection means to detect the closing motion rate of a door, and the control means which undergoes the output of this speed detection means and controls the assistant force by the above-mentioned actuator according to the closing motion rate of a door.

[0008] Moreover, invention of claim 3 will be taken as the configuration equipped with the control means which controls the assistant force by the above-mentioned actuator in the direction which the assistant force increases, if the output of a door opening close detection means to detect the closing

motion location of a door, and this door opening close detection means is undergone and a door becomes a predetermined location.

[0009] Invention of claim 4 is taken as a configuration equipped with a switching operation detection means to detect the switching operation from the switching operation and the door outer side from door inner of a door, and the control means which controls the driving force of an actuator so that the output of this door opening close actuation detection means is undergone and the assistant force changes in the time of the switching operation from door inner, and the switching operation from a door outer side.

[0010] Invention of claim 5 is taken as a configuration equipped with an inclination degree detection means to detect the inclination degree of a door, and the control means which undergoes the output of this inclination degree detection means, and controls the driving force of an actuator according to the inclination degree of an automobile.

[0011] Invention of claim 6 undergoes the output of a condition detection means which can be run to detect whether an automobile is in the condition which can be run, and this condition detection means that can be run, and when an automobile is in the condition which can be run, it is taken as a configuration equipped with the control means which forbids actuation of an actuator.

[0012] Invention of claim 7 undergoes the output of an obstruction detection means to detect the obstruction in the closing motion locus of a door, and this obstruction detection means, and when an obstruction is in the closing motion locus of a door, it is taken as a configuration equipped with the control means which forbids actuation of an actuator.

[0013] Invention of claim 8 is taken as a configuration equipped with a door location detection means to detect the open position and closed position of a door, and the control means which undergoes the output of this door location detection means, controls an actuator an open position and near a closed position a door, and makes a door rate late.

[0014]

[Function] According to invention of claim 1, according to the switching operation force of a door, the assistant force by the actuator which assists a door [closing motion] is controlled.

[0015] According to invention of claim 2, according to the closing motion rate of a door, the assistant force by the actuator which assists a door [closing motion] is controlled, and when the closing motion rate of a door is quick, assistant torque is raised compared with the late time.

[0016] According to invention of claim 3, if a door becomes a predetermined location, the assistant force by the actuator which assists a door [closing motion] will be controlled in the direction which the assistant force increases, and the assistant force in a predetermined location will be raised to it.

[0017] According to invention of claim 4, the driving force of an actuator is controlled so that the assistant force changes in the time of the switching operation from door inner, and the switching operation from a door outer side.

[0018] According to invention of claim 5, according to the inclination degree of an automobile, the driving force of the actuator which assists a door [closing motion] is controlled. That is, in the case of the direction whose inclination increases an operating physical force, the assistant force is increased, and, in the case of the direction where an inclination reduces an operating physical force conversely, the assistant force is omitted.

[0019] According to invention of claim 6, when an automobile is in the condition which can be run, actuation of the actuator which assists a door [closing motion] is forbidden, and the assistant force is omitted.

[0020] Moreover, according to invention of claim 7, when an obstruction is in the closing motion locus of a door, actuation of the actuator which assists a door [closing motion] is forbidden, and the assistant force is omitted. [0021] According to invention of claim 8, the actuator which assists a door [closing motion] is controlled an open position and near a closed position a door, and the assistant force is made small.

[0022]

[Example] Hereafter, the example of this invention is explained to a detail along with a drawing.

[0023] door hinge means 2A which 1 is the door of an automobile and has inner panel 1a and outer

panel 1b in drawing 1 and drawing 2 which show an outline configuration, is arranged up and down and has rotation shaft 2a of the vertical direction into a car body 13, and 2B -- minding -- closing motion -- being possible (rotatable) -- it is pivoted.

[0024] It is the abbreviation mid-position of door hinge means 2A and the vertical direction of 2B, and the end section of the assistant force grant member 4 is pivoted rotatable to the car body 13 in the hinge shaft 3 of that, and the offset location. Specifically, the end section of the assistant force grant member 4 is pivoted rotatable by the bracket 5 fixed to the car body 13.

[0025] 6 is the motor which is an actuator, is arranged in the interior of a door 1 (between inner panel 1a and outer panel 1b), and has become a driving source for giving the assistant force of assisting closing motion of a door 1. Moreover, a motor 6 is in a so-called free condition, when a current is intercepted.

[0026] In addition, 7 is window glass, and it is constituted so that it may go up and down by the window regulator 8. For 9, as for a door trim and 11, a door-lock assembly and 10 are [a floor panel and 12] side sills.

[0027] Moreover, as the above-mentioned motor 6 shows a detail to drawing 3 - drawing 5, a gear 21 fixes to the motor shaft 6a, and this gear 21 is coordinated with the other end of the assistant force grant member 4 through the movement conversion means 22.

[0028] A reduction gear 23 gears on a gear 21, and it specifically fixes in the end section of the worm-gearing shaft 24 with which this reduction gear 23 is prolonged in parallel with the assistant force grant member 4, and this worm-gearing shaft 24 is constituted so that moderation rotation may be carried out by the motor 6.

[0029] 25 is a slider and connection section 25a has 25d of engagement sections prolonged in the opposite side from connection section 25a by which pin association is carried out at the end section of the assistant force grant member 4, tubed part 25c which has internal-tooth 25b which gears on the worm-gearing shaft 24, and this tubed part 25c.

[0030] It has square tubed part 26b which has opening 26a in which 26 is a motor case in the air, and the other end of the assistant force grant member 4 projects, and bond part 26c which is formed successively by the end section of this tubed part 26b, and is prolonged caudad, and this bond part 26c is combined with flange 6b of a motor 6. And the assistant force grant member 4, the worm-gearing shaft 24, a reduction gear 23, and slider 25 grade are contained inside the motor case 26 by this integrated state. Moreover, 26d of guide rails with which 25d of engagement sections of a slider 25 engages possible [a slide] is formed in the wall section of the motor case 26.

[0031] And a movement conversion means 22 to change rotation actuation of a motor 6 into assistant force grant movement of the assistant force grant member 4 is constituted by the assistant force grant member 4, the worm-gearing shaft 24, the reduction gear 23, and the slider 25 grade.

[0032] Moreover, as shown in drawing 6 - drawing 11, the actuation switches 39 and 41 which control actuation of a motor 6 and a halt are arranged by the inner handle 36 and the outer handle 37 which are the closing motion control unit of a door 1.

[0033] That is, as shown in drawing 6 and drawing 7, the inner handle 36 is pivoted in the attachment section 35 of inner panel 1a rotatable, and the operating member 43 coordinated with the door-lock assembly 9 is connected with this inner handle 36. Moreover, the actuation switch 39 (pusher switch) is attached through the mounting bracket 38. And since the actuation switch 39 is pressed in case the inner handle 36 is rotated, this actuation switch 39 closes, a rotation drive is carried out in the predetermined direction, and a motor 6 generates the assistant force for the door opening close.

[0034] On the other hand, as shown in drawing 6, drawing 8, and drawing 93, the outer handle 37 is pivoted in outer panel 1b rotatable in two hinge regions 37A and 37B approximately, and the actuation switch 41 (pull switch) is formed in near [one] hinge region 37A between a mounting bracket 40 and attachment section 37a of the outer handle 37. And when rotation actuation of the outer handle 37 is carried out, the actuation switch 41 is pulled, the rotation drive of the motor 6 is carried out in the predetermined direction, and the assistant force for closing motion of a door 1 is generated. Moreover, in near hinge region 37B of another side, lobe 37b of the outer handle 37 is coordinated with the door-lock assembly 9 through the operating member 42.

[0035] Moreover, as shown in drawing 10 and drawing 11, the bottom and the bottom actuation switching means 52 and 53 for generating the assistant force of also assisting the door trim 10 of the armrest section 51 and its bottom with the door opening close besides both the above-mentioned switches 39 and 41 are arranged. In the case of the bottom actuation switching means 52 of the armrest section 51, as shown in drawing 10 and drawing 11, specifically, attachment immobilization of the substrate section 54 which has puncturing 54a in the center section in the door trim 10 is carried out. movable Itabe 55 on whom lobe 55a which is inserted in this substrate section 54 possible [the slide to puncturing 54a], and has a tip thread part protruded is movable -- it is attached through the spring 56, the washer 57, and the nut 58 like. Moreover, movable Itabe's 55 guide shank material 55b prepared corresponding to them and -- are made to fit in possible [a slide] by guide pore 54b arranged in four corners of the substrate section 54, and --. And it is between both **** 54 and 55, and the actuation switches 59, 59, 59, and 59 for carrying out drive control of the motor 6 in near of each guide shank material 55b and -- are arranged. In addition, the bottom actuation switching means 53 is also the same configuration as the bottom actuation switching means 52.

[0036] Moreover, the torque sensor 71 which is arranged in door hinge means 2A of a door 1 top, and detects the closing motion operating physical force of a door 1, and the inclination condition of a car as 61 is a control unit and it is shown in drawing 12, The rotation sensor 72 which is arranged in door hinge means 2B of the door 1 bottom, and detects the closing motion rate and the closing motion direction of a door 1, The position sensor 73 which detects the open position of a door, and a closed position while being arranged by the hinge region of the door 1 bottom and detecting the closing motion include angle of a door 1, The inner handle switch 74 which is coordinated with the inner handle 36 and detects the actuation from an interior-of-a-room side, The outer handle switch 75 which is coordinated with the door outer handle 37 and detects the actuation from a vehicle outside, The speed sensor 76 which detects whether it is coordinated with a speedometer (not shown) and an automobile is in the condition which can be run, The signal from the path clearance sonar 78 which detects whether it is arranged by the key cylinder part 77 and an obstruction is in the closing motion locus of a door 1 is received, a motor 6 is driven through a power unit 79, and the assistant force grant member 4 is controlled. 80 is a dc-battery.

[0037] In addition, as shown in drawing 13, drive control is carried out by power relay 81, a current is intercepted with the fail-safe relay 82, and drive detection of the power unit 79 is carried out by the current sensor 83. The assistant force control within switching operation, the assistant force cut under a certain conditions, Modification of the hand of cut of the motor 6 in the assistant force cut, open actuation, and closed actuation at the time of abnormalities, The signal from a control unit 61 is received for the auto-stop which detects an obstruction, and they are a bridge circuit B1 - B4. It is constituted so that it may carry out by minding and controlling a motorised current by the drive circuit 84. 85 is 86 and the Maine fuse and 86 are fuses. A bridge circuit B1 - B4 Basic control is as being shown in Table 1.

[0038]

[Table 1]

	B 1	B 2	B 3	B 4
開操作	ON	OFF	OFF	トルク制御
全 開	OFF	OFF	OFF	OFF
閉操作	OFF	ON	トルク制御	OFF
全 閉	OFF	OFF	OFF	OFF

Specifically according to the switching operation force of the door 1 detected by the torque sensor 71, the assistant force by the motor 6 which assists the door [closing motion] 1 is controlled.

[0039] When switching operation quicker than the closing motion rate of the door 1 by assistant force grant is carried out, in order to prevent that operability falls, according to the switching operation rate of the door 1 detected by the rotation sensor 72, the assistant force by the motor 6 which assists the door

[closing motion] 1 is controlled. That is, when the closing motion rate of a door 1 is quick, the assistant force is heightened compared with the time when a closing motion rate is slow. And like [in the case of lifting a hand, for example], when a closing motion rate is still quicker, acceleration is detected based on the closing motion rate detected by the rotation sensor 72, if it judges that rotation of a motor 6 cannot be followed, the current to a motor 6 will be omitted, a motor 6 will be made into a free condition, and attenuation control will be carried out a close by-pass bulb completely or near an open position.

[0040] Detection of that the door 1 became a predetermined location by the signal from a position sensor 73 controls the assistant force by the motor 6 which assists the door [closing motion] 1 in the direction which the assistant force increases.

[0041] Since how differs, the driving force of a motor 6 is controlled by the time of the switching operation from door inner (vehicle interior-of-a-room side), and the switching operation from a door outer side (vehicle outside) so that the assistant force changes according to how. [the force of those who open and close a door 1] [the force] With the inner handle switch 74 and the outer handle switch 75, since, as for a telophase, the force cannot enter easily by detecting whether it is the switching operation from door inner, or it is the switching operation from a door outer side, and the force tending to enter by that cause the first stage in the case of the open operation from a door outer side, it is small in the assistant force and, specifically, a telophase is enlarged the first stage. On the other hand, since, as for a telophase, the force tends to enter by the ability of the force not entering easily the first stage in the case of the open operation from door inner, it is large in the assistant force and a telophase is made small the first stage. Moreover, since the force cannot enter easily at the time of the closed actuation from whenever [Taikai] in the closed actuation from a door outer side, it is large in the assistant force, and at the time of the closed actuation from small opening, since the force tends to enter, the assistant force is made small. Since the force tends to enter at the time of the closed actuation from whenever [Taikai] in the closed actuation from door inner, it is small in the assistant force, and at the time of the closed actuation from small opening, since the force cannot enter easily, the assistant force is enlarged.

[0042] The inclination condition of an automobile is detected by the torque sensor 71, and the driving force of the motor 6 which assists the door [closing motion] 1 is controlled by it according to the inclination degree of an automobile. That is, the eccentric torque of a torque sensor 71 is detected, an inclination is judged according to torque value and the direction of torque, and in the case of the direction where an inclination reduces an operating physical force conversely, the assistant force is omitted while increasing the assistant force in the case of the direction whose inclination increases an operating physical force. However, at the time of the open operation from door inner, if the hand (or a part of body) from an actuation switch separates, a power unit 79 is made to short-circuit, and it is constituted so that an auto-stop may be applied.

[0043] Detection of that an automobile is in the condition which can be run with a speed sensor 76 forbids actuation of the motor 6 which assists the door [closing motion] 1.

[0044] Detection of that an obstruction is in the closing motion locus of a door by the path clearance sonar 78 forbids actuation of the motor 6 which assists the door [closing motion] 1.

[0045] If the open position and closed position of a door 1 are detected by the above-mentioned position sensor 73, near, the motor 6 which assists a door [closing motion] will be controlled near [those] a location, and the assistant force will be made small. By this, those who are opening and closing the door 1 can recognize that they are a closed position or an open position.

[0046] The assistant force by the side of curvature (the closed direction) is heightened from a reversal halt location, without performing the usual control, if detected as it being at the reversal actuation [that the reversal to the closed actuation from the open actuation at the time of quick getting on and off etc. is quick] time by the torque sensor 71 and the rotation sensor 72.

[0047] In addition, the priority of control of the place mentioned above is the order of an inclination, a rotational frequency, torque, and an obstruction, and shows an example of the control map of the concrete assistant force in the next table 2.

[0048]

[Table 2]

通	常	操	作	開		選		作	開	開	開	操		作				
				開	度	開	度					開	度					
通	常	操	作	ア	ウ	タ	側	操	作	作	作	開	度	大	全	開		
				イ	ン	ナ	側	操	作	作	作	開	度	小	小	小		
				ア	ウ	タ	側	操	作	作	作	開	度	大	大	大		
				イ	ン	ナ	側	操	作	作	作	開	度	大	大	大		
速	い	操	作	ア	ウ	タ	側	操	作	作	作	開	度	大	減	衰	制	御
				イ	ン	ナ	側	操	作	作	作	開	度	小	小	小	小	
				ア	ウ	タ	側	操	作	作	作	開	度	大	大	大	大	
				イ	ン	ナ	側	操	作	作	作	開	度	大	大	大	大	
傾	斜	の	開	ア	ウ	タ	側	操	作	作	作	開	度	大	減	衰	制	御
				イ	ン	ナ	側	操	作	作	作	開	度	小	小	小	小	
				ア	ウ	タ	側	操	作	作	作	開	度	大	大	大	大	
				イ	ン	ナ	側	操	作	作	作	開	度	大	大	大	大	
傾	斜	の	開	ア	ウ	タ	側	操	作	作	作	開	度	大	減	衰	制	御
				イ	ン	ナ	側	操	作	作	作	開	度	小	小	小	小	
				ア	ウ	タ	側	操	作	作	作	開	度	大	大	大	大	
				イ	ン	ナ	側	操	作	作	作	開	度	大	大	大	大	

Then, the contents of control are concretely explained along with drawing 14.

[0049] A start judges first whether it is ON for an ignition key (not shown) (step S1). If an ignition key is not ON, since the car has stopped and a door 1 must have been opened and closed, a motor 6 is made free (step S2).

[0050] If an ignition key is ON, it will judge continuously whether it is the vehicle speed $V = 0$ (step S3). If it is not the vehicle speed $V = 0$, since a door must have been opened and closed, a motor 6 is made free (step S2).

[0051] it judges whether it is inner actuation if it is the vehicle speed $V=0$ (step S4), and if it is inner actuation, an inner actuation map (part about inner actuation of Table 2) will be chosen -- on the other hand (step S4), if it is not inner actuation, since it is outer side actuation, an outer actuation map (part about outer actuation of Table 2) is chosen (step S6).

[0052] and it judges whether it is in an inclination condition (step S7), and if it is in an inclination condition, an inclination map (part about the actuation at the time of the inclination of Table 2) will be chosen -- on the other hand (step S8), if it is not in an inclination condition Usually, a map (part except the part about the actuation at the time of the inclination of Table 2) is chosen (step S9), and it judges whether it is open operation initiation of a door 1 by the signal from a position sensor 73 (step S10).

[0053] If it is open operation initiation of a door, it will judge whether the closing motion rate of a door 1 can be detected based on the signal from the rotation sensor 72 (step S11), and acceleration can be calculated, and rotation of a motor 6 can follow change of the closing motion rate of the door 1 by the operator (step S12).

[0054] and if it can follow, the signal from a torque sensor 71 will detect the switching operation force of a door -- on the other hand (step S13), if it cannot follow, a motor 6 is made free (step S2).

[0055] And if it judges whether rotation of a motor 6 can be followed (step S14) and it cannot be followed at change of the switching operation force of a door 1, let a motor 6 be a rotation free-lancer (step S2).

[0056] If it judges whether there will be any obstruction if it can follow (step S15) and there is an obstruction, a motor 6 will be suspended in order to avoid a collision (step S19). If there is no obstruction, it will judge whether it is near an open position with a position sensor 73 (step S16), and if it is not near an open position, to step S15, if it is return and near an open position, a motor 6 will be controlled (step S17), the closing motion rate of a door 1 will be made late, and it will judge whether it is full open (step S18).

[0057] a motor 6 will be suspended if it is full open -- on the other hand (step S19), if it is not full open, it will return to step S17.

[0058] In addition, the check of an obstruction is not performed although control in closed actuation of a door 1 as well as the case of the open operation of a door 1 is performed.

[0059]

[Effect of the Invention] Since invention of claim 1 controlled the assistant force by the actuator which assists a door [closing motion] as mentioned above according to the closing motion operating physical force of a door, it can open and close a door reasonable.

[0060] Invention of claim 2 can open and close a door, without sensing sense of incongruity, since the assistant force by the actuator which assists a door [closing motion] was controlled according to the closing motion rate of a door.

[0061] Since invention of claim 3 controlled the assistant force by the actuator which assists a door [closing motion] in the direction which the assistant force increases when the door became a predetermined location, it can assist a door [closing motion] according to a demand.

[0062] invention of claim 4 changes the assistant force in the time of the switching operation from door inner, and the switching operation from a door outer side -- as -- the driving force of an actuator -- control **** -- since it was made like, the assistant force can be changed according to a door outer side and door inner demand.

[0063] Since invention of claim 5 controlled the driving force of the actuator which assists a door [closing motion] according to the inclination degree of an automobile, it can perform closing motion of a door reasonable also on a slope etc.

[0064] Since invention of claim 6 forbade actuation of the actuator which assists a door [closing motion] when an automobile was in the condition which can be run, closing motion of a door is not simply performed in the condition of an automobile which can be run.

[0065] Since invention of claim 7 forbade actuation of the actuator which assists a door [closing motion] when an obstruction was in the closing motion locus of a door, it does not have a possibility that assistance of closing motion of a door may have a bad influence on evasion of an obstruction.

[0066] Since invention of claim 8 controls the actuator which is an open position and near a closed position a door, and assists a door [closing motion] and is made to make a door rate slow, it does not have a possibility that the excessive force may act on a door an open position and near a closed position a door.

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DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]

[Drawing 1] It is the outline block diagram of the door equipment of an automobile.

[Drawing 2] It is the longitudinal sectional view of the door equipment of an automobile.

[Drawing 3] III-III of drawing 1 It is a sectional view in a line.

[Drawing 4] It is the decomposition perspective view showing a movement conversion means.

[Drawing 5] It is this longitudinal sectional view.

[Drawing 6] It is the explanatory view of arrangement of an actuation switch.

[Drawing 7] It is the explanatory view of the actuation switch of the inner handle section.

[Drawing 8] It is the explanatory view of the actuation switch of the outer handle section.

[Drawing 9] It is the explanatory view of the outer handle section.

[Drawing 10] It is the sectional view showing another actuation switch section.

[Drawing 11] It is the decomposition perspective view of the actuation switch section.

[Drawing 12] It is the explanatory view of the arrangement location of the various switches which constitute a control system.

[Drawing 13] It is the block diagram showing a control system.

[Drawing 14] It is the flow chart Fig. showing an example of a control system.

[Description of Notations]

1 Door

4 Assistant Force Grant Member

6 Motor (Actuator)

36 Inner Handle

37 Outer Handle

61 Control Unit

71 Torque Sensor (Operating-Physical-Force Detection Means, Inclination Degree Detection Means)

72 Rotation Sensor (Speed Detection Means)

73 Position Sensor (Door Opening Close Detection Means, Door Location Detection Means)

74 Inner Handle Switch (Switching Operation Detection Means)

75 Outer Handle Switch (Switching Operation Detection Means)

76 Speed Sensor (Condition Detection Means Which Can be Run)

78 Path Clearance Sonar (Obstruction Detection Means)

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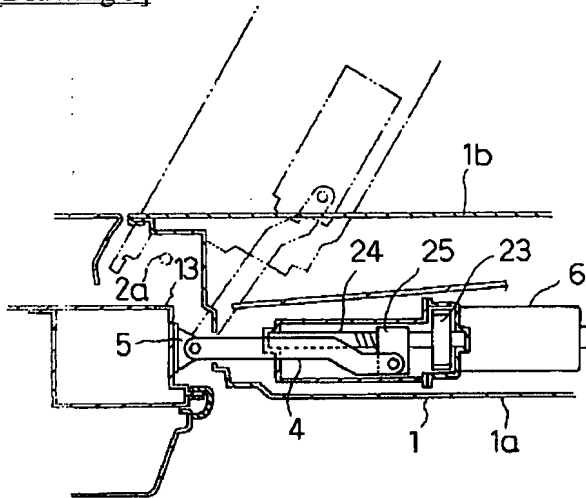
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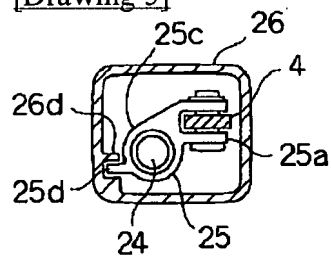
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DRAWINGS

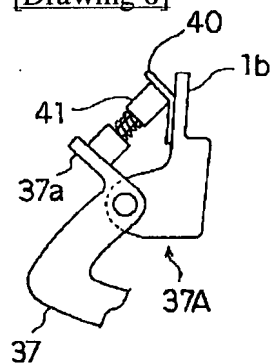
[Drawing 3]



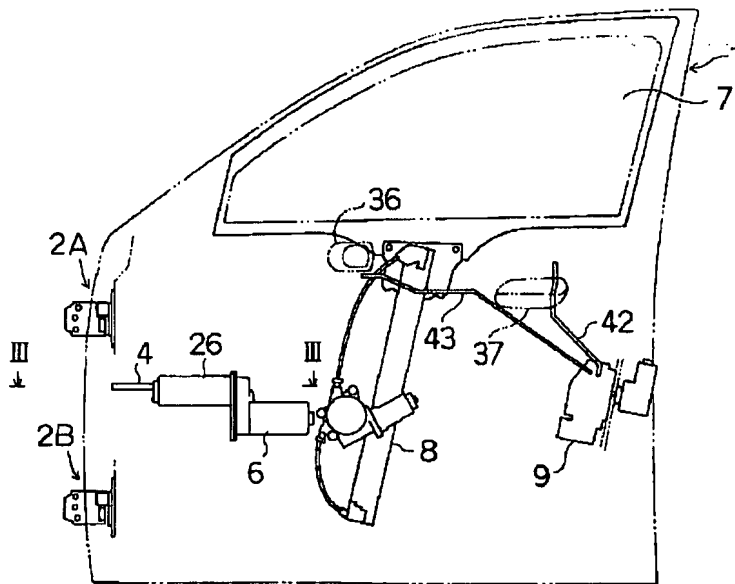
[Drawing 5]



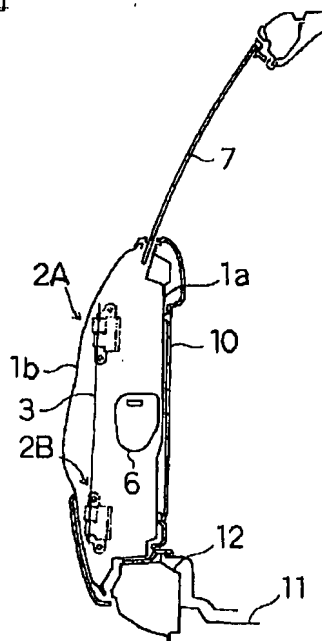
[Drawing 8]



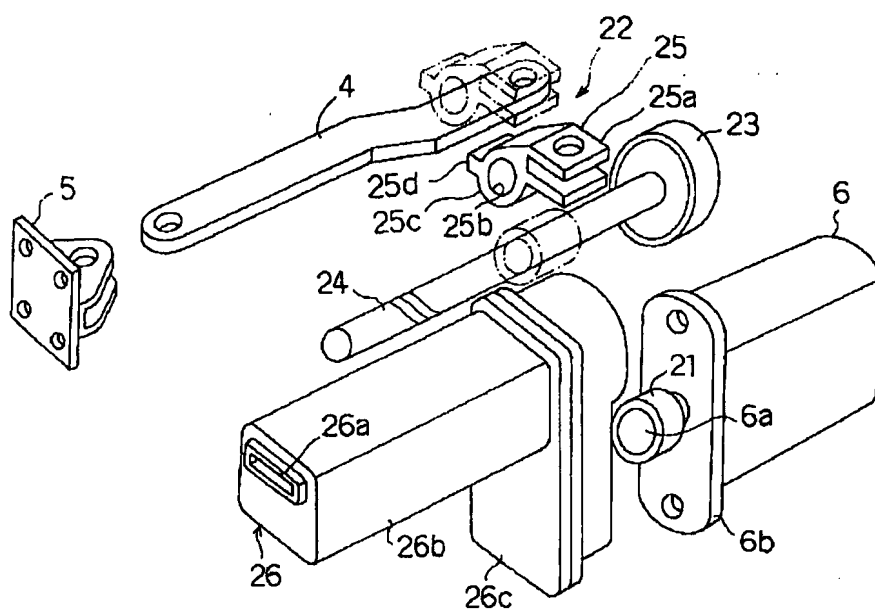
[Drawing 1]



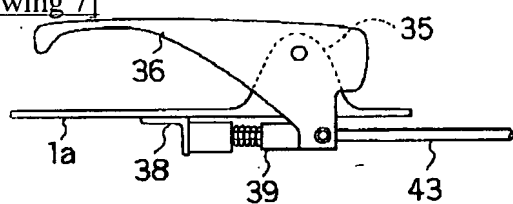
[Drawing 2]



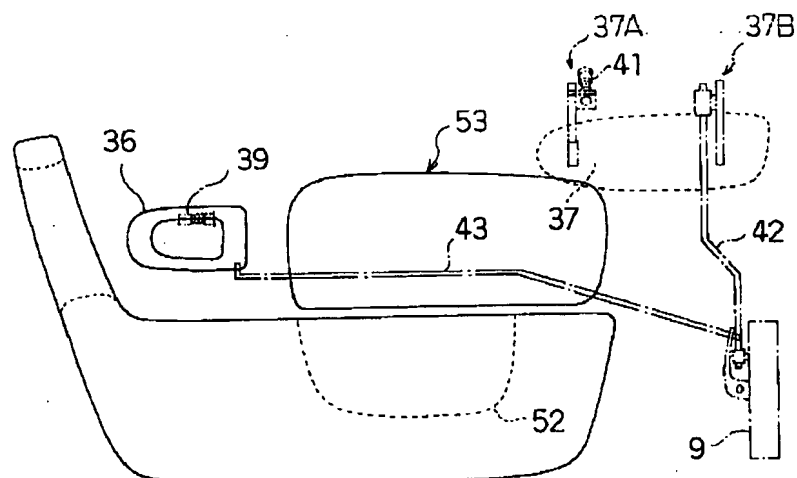
[Drawing 4]



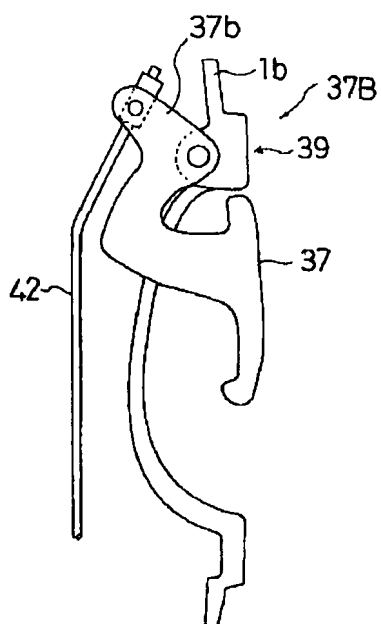
[Drawing 7]



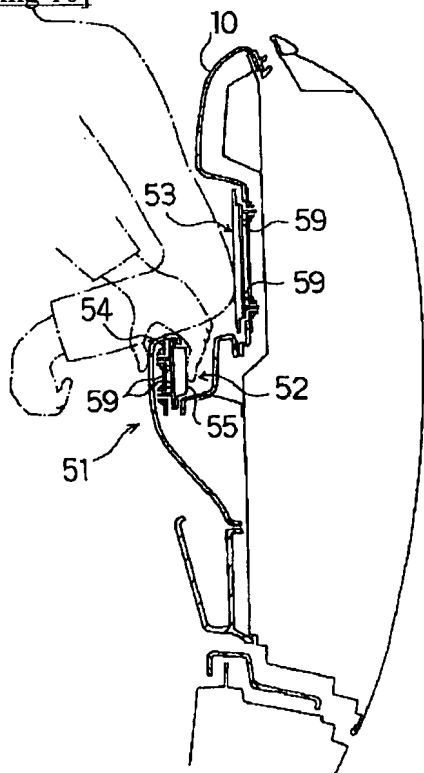
[Drawing 6]



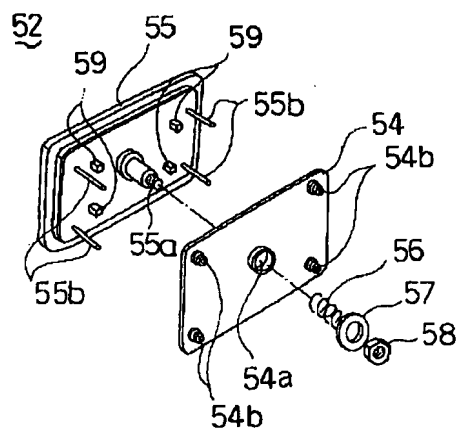
[Drawing 9]



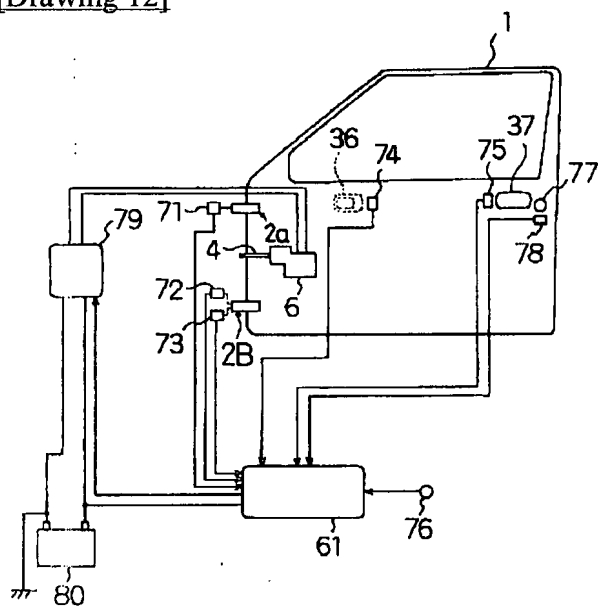
[Drawing 10]



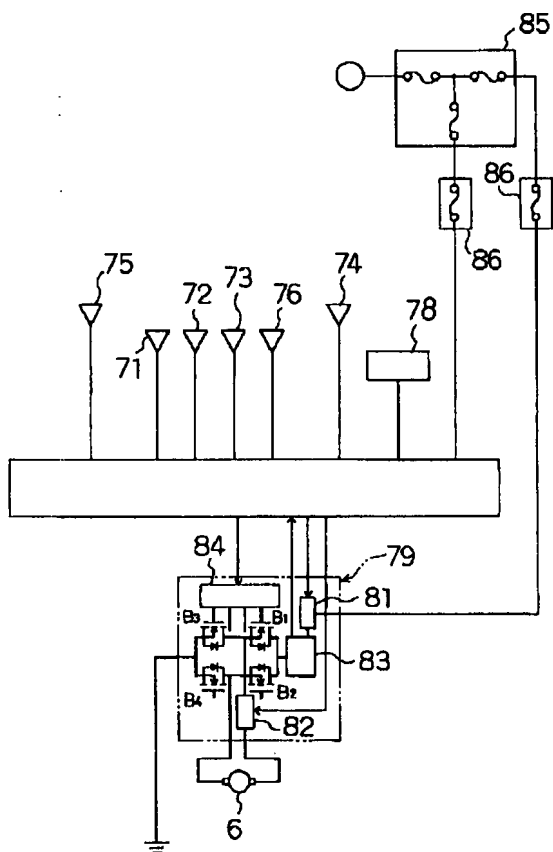
[Drawing 11]



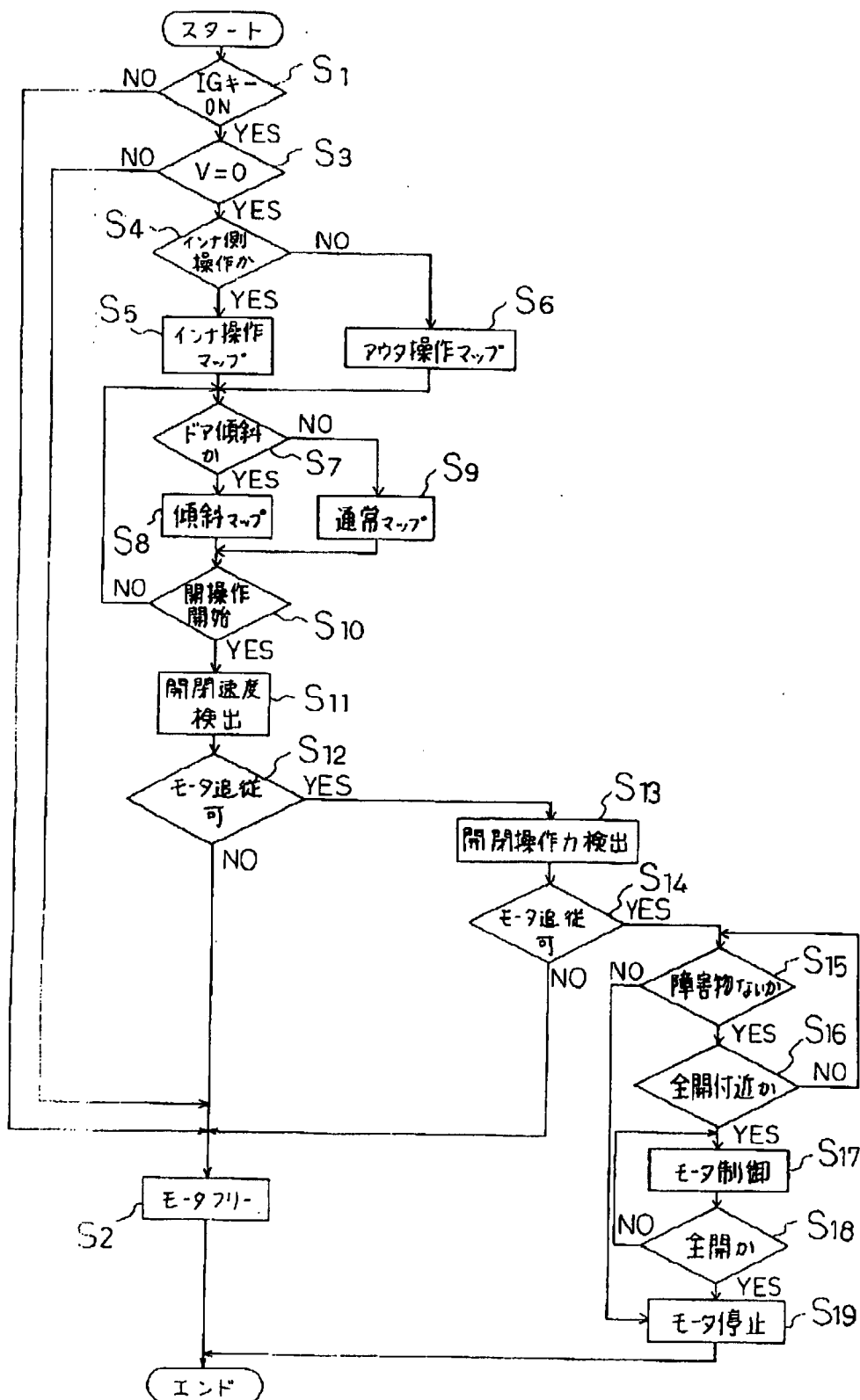
[Drawing 12]



[Drawing 13]



[Drawing 14]



[Translation done.]